Washington Forest Practices Adaptive Management Science Conference
April 5, 2005
The Evergreen State College, Longhouse North Room
Olympia WA
8:30 A.M. to 4:40 P.M.

Session 1

8:30 am	**Introduction**	Nancy Sturhan, Doug Martin, Geoffrey McNaughton
8:40 am	Dunn's and Van Dyke's Salamander Habitat Use Patterns in Managed Forests	Marc Hayes, WDFW
8:55 am	Progress on Site Selection for the Type N Buffer Treatment Study	Aimee McIntyre, WDFW
9:10 am	Amphibian Use of Seeps in Managed Forests	Ryan O'Donnell, Marc Hayes and Timothy Quinn, WDFW
9:25 am	Yakima Bull Trout Radiotelemetry Study	Michael Mizell and Eric Anderson, WDFW
9:45 am	Forest Wetland Regeneration Pilot Study	Patricia Johnson, WDOE
10:00 am	Session 1 Question and Answer Session	
10:10 am	**Break**	

Session 2

10:25 am	The Fish Habitat Model: Predicting the Upper Limits of Fish Habitat in Eastern and Western Washington	Steve Duke, Weyerhaeuser; Bob Conrad, NWIFC; Martin Liermann, NOAA; and Eddie Cupp, Terrapin Environmental
10:40am	Water typing Model Field Performance Assessment: Approach and Procedures	Eddie Cupp, Terrapin Environmental
1050 am	Type 5 Experimental Study: Stream Temperature Data	Jack Janisch, WDOE
11:05 am	Type N Buffer Characteristics, Integrity and Function: an Overview of Data Collected and Dilemmas in Data Collection Methodologies	Dave Schuett-Hames, CMER
11:20 am	Pre-hardwood Conversion Harvest Vegetation Characteristics on Westside Type F Streams	Steve McConnell, NWIFC
11:35 am	Pre-Hardwood Conversion Harvest Stream Temperature and Shade Characteristics on Westside Type F Streams	Mark Hunter, WDFW
11:50 am	Session 2 Question and Answer Session	
12:00 pm	**Lunch**	

Session 3

1:00 pm	Forest Practices Application Analyses: Current and Possible Future Stand Characteristics	Steve McConnell, NWIFC
1:15 pm	Roads Program Overview	Drew Coe, Nooksack Tribe
1:25 pm	Forest Road Hydrology Literature Review	Drew Coe, Nooksack Tribe
1:35 pm	Road Sub-Basin Scale Effectiveness Monitoring Design	Mary Raines, NWIFC
1:50 pm	Unstable Slopes Program Overview	Julie Dieu, Rayonier
2:00 pm	Landslide Hazard Zonation	Laura Vaugeois, DNR
2:15 pm	Regional Unstable Landforms Identification Project	Venice Goetz, DNR
2:30 pm	Session 3 Question and Answer Session	
2:40 pm	**Break**	

Session 4

2:55 pm	Overview of Eastern Washington Riparian Assessment Program	Kris Ray, Colville Confederated Tribes
3:05 pm	Review of the Available Literature Related to Wood Loading Dynamics in and Around Streams in Eastern Washington Forests	Lynda Hofmann, WDFW
3:20 pm	A Review and Synthesis of Available Information on Riparian Disturbance Regimes in Eastern Washington	Lynda Hofmann, WDFW
3:35 pm	Current Conditions of Riparian Stands in Eastern Washington: A Proposal	Mike Bonoff, Mason, Bruce & Girard
3:50 pm	Eastside Riparian Shade and Temperature Effectiveness Study	Eddie Cupp, Terrapin Environmental
4:10 pm	Effectiveness of the Current TFW Shade Methodology for Measuring Attenuation of Solar Radiation to the Stream: Pre-Harvest Field Summary	Dale McGreer, Western Watershed Analysts; Mike Bonoff, Mason, Bruce & Girard
4:30 pm	Session 4 Question and Answer Session	

Posters

A Comparison of Three Methods for Detecting Amphibians in Seeps	Ryan O'Donnell, Marc Hayes and Timothy Quinn, WDFW
Tailed Frog Meta-Analysis	Marc Hayes, WDFW
Effects of Shade Retention on In-Stream Amphibians	Jim MacCracken, Longview Fibre Company
Toward a Classification of Headwater Streams: Reach Sequences	Robert Palmquist, NWIFC
The Role of Wood in Headwater Streams of the Northwest Cascades (Study in progress)	Curt Veldhuisen, Mike Olis, Skagit River System Cooperative; Drew Coe, Nooksack Tribe; Dave Luzi, Tulalip Tribe

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http://www.evergreen.edu/tour/map.htm

Driving directions can be accessed at the following link:

http://www.evergreen.edu/conference/drivingdirections.htm

Session 1

Abstracts

Amphibian Use of Seeps in Managed Forests

Contacts: Ryan P. O'Donnell, Marc P. Hayes, and Timothy Quinn
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Seeps are thought to provide important habitat for some amphibian species, but little research has been done to compare amphibian habitat use between seeps and otherwise similar non-seep habitats. We compared amphibian species and life stages detected in seeps to those in habitats that did not contain seeps (non-seeps). We searched for amphibians in ten seeps and ten nearby non-seeps by turning over and replacing available cover objects once every three weeks for 18 weeks, from July to November. Areas searched were circles with a 6 m radius that was centered in the seep or an equal distance from the stream for non-seeps. Seeps had higher species richness than non-seeps. More individual Columbia torrent salamanders (*Rhyacotriton kezeri*) were found in seeps than non-seeps throughout the study. More coastal tailed frogs (*Ascaphus truei*) were found in seeps than non-seeps until early September, but habitats did not differ after mid-September. Seeps and non-seeps did not significantly differ in the number of Western red-backed salamanders (*Plethodon vehiculum*) or red-legged frogs (*Rana aurora*) detected. Seeps were more likely to contain larval Columbia torrent salamanders than non-seeps. Seeps are important habitat features for some amphibian species and life stages, specifically larval Columbia torrent salamanders and adult tailed frogs in the summer.

Progress on Site Selection for the Type N Buffer Treatment Study

Landscape and Wildlife Advisory Group (LWAG) and
Riparian Scientific Advisory Group (RSAG)

Contact: Aimee McIntyre, WDFW

The Type N Buffer Treatment Study will assess the effectiveness of the Forest and Fish Report (FFR) patch buffer prescriptions along non-fishbearing (Type N) streams. We will compare one application of the FFR buffer to 3 alternative treatments (0% of length buffered, 100% buffered, and an unharvested reference). These four treatments will be replicated among 5 blocks, for a total of 20 sites. Differences in treatments will be measured in changes of amphibian occupancy and density, water quality, primary productivity, and elements exported to fishbearing streams (e.g., invertebrates). Site selection has involved interactive cooperation among 2 state and 2 federal agencies, 8 private landowners, and 2 Indian nations. Using GIS, we screened 35,957 non-fishbearing basins based on selection criteria including basin size, stand age, elevation, gradient, and geology. To date, 431 basins from 10 cooperators have met initial criteria. After additional screening, qualifying basins will be visited to verify the presence of stream-associated amphibians (including *Ascaphus*, *Rhyacotriton*, and *Dicamptodon* species) and accuracy of GIS data. To date, 23 qualifying basins have been visited. Once amphibian presence is verified, sites will be grouped into blocks based on additional criteria. The end product of the site selection process will be a report detailing the distribution and characteristics of available sites, and how sites that do not completely qualify under the current study design differ from qualifying sites. If sufficient sites do not exist under the current selection criteria, modifications of the selection criteria may be necessary.

A Comparison of Three Methods for Detecting Amphibians in Seeps

Contacts: Ryan P. O'Donnell, Marc P. Hayes, and Timothy Quinn
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Seeps provide important habitat for many amphibian species, but no standard method has been developed to sample amphibians in these unique habitats. We compared three methods for sampling amphibians in seeps: one passive (trapping) and two active (light-touch and destructive sampling). Trapping was conducted with paired traps located on the distal ends of three 3-m drift fence arms radiating from a central point. Both active methods involved searching a 6 m radius circle centered on each trap array, light-touch by turning over and replacing cover objects and destructive sampling by searching to a depth of 15 cm and dismantling all woody debris. All three methods were applied to each of ten seeps in managed forests of SW Washington. Trapping and light-touch were compared across six 3-week sampling periods. Within each 3-week period, trapping was conducted over a 3-day interval, whereas light-touch sampling was conducted only on the last trap day of each period. Destructive sampling was conducted only after the final sampling period. Light-touch detected more species than trapping, and also detected greater numbers of eight of the 10 species. No larvae of any species were caught in traps. There were no significant differences between the two active methods in the species or life stages detected. However, light-touch has the advantages of repeatability, less impact on the habitat, and lower cost. For these reasons, we recommend the use of light-touch over both destructive sampling and trapping for detecting maximum species richness of amphibians and maximum numbers of common species in seeps.

Yakima Basin Bull Trout Radio Telemetry Study

Contact: Eric Anderson and Michael Mizell
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Uncertainty regarding the distribution, migratory patterns, and habitat preferences of some populations of adult and sub-adult bull trout (*Salvelinus confluentus*) in the Yakima basin constrains effective management for this species. Adfluvial populations are well studied, but a lack of information still exists on fluvial and resident forms. A radio telemetry study was initiated in the fall of 2003 to increase our knowledge of fluvial and resident bull trout populations. The study also informs managers about habitat suitability that relates to survey protocols and the bull trout habitat overlay. Radio-tagged fluvial bull trout (adults and sub-adults) are already providing significant information on movement patterns, habitat preferences, and over-wintering areas. Preliminary results indicate that: 1) the adult bull trout in most fluvial populations over winter in just a few deep "holes" in the Naches River (a major tributary of the Yakima River), 2) staging and spawn timing varies among populations, even those separated by only a few miles, 3) telemetry (radio-tracking) confirms known spawning grounds as being accurate; so far, no new spawning grounds have been discovered, and 4) according to telemetry and weir (trap) monitoring, two of the local populations appear to be isolated or semi-isolated (resident) populations. As the study progresses, we will continue to document and report on spring/summer movement patterns, pre- and post-spawning movements and evaluate connectivity between populations. This information will also help fish managers protect bull trout populations during critical periods when they may be vulnerable to impacts associated with recreational (e.g., fishing) or land use / land development activities and will provide valuable information for recovery of the species.

Forested Wetlands Literature Survey and Synthesis Paper- Abstract

Contact: Patricia Johnson, Department of Ecology

The purpose of this study was to review literature with respect to commercial forest practices and forested wetland functions in the Pacific Northwest (PNW). It was limited in scope to an evaluation of forested wetlands and does not cover floodplain wetlands or any topic that is more riparian-related. Despite a large number of publications cited in this synthesis, there remains much to be understood about forested wetlands. There are substantial information gaps regarding the characterization of forested wetlands, including but not limited to studies of water quality, hydrology, and fish and wildlife use. Little data exists regarding the direct and indirect effects of forest management on forested wetland ecosystems.

Several recommendations are made for future research and data needs, including hydro-geomorphic classification of forested wetlands, water quality, wildlife relationships, and examining cause and effects relationships in forested wetlands following timber management.

While there is a large body of general and related information, there is little work that is specific to forested-wetlands. Forested wetlands are found in the landscape continuum between and within riparian and upland areas, which are each studied extensively but do not delineate forested wetlands out as a separate ecological zone.

Several issues important to forested wetlands were not addressed as they were beyond the scope of this document. It is recommended that readers conduct subject-specific literature reviews of those issues, should the information be required for future research; for example, fish use of forested wetlands, groundwater discharge and recharge functions, and floodplain ecology.

Forested Wetland Regeneration Pilot Study

Contact: Patricia Johnson, Department of Ecology

Abstract:
This pilot study was developed to test methods for collecting, summarizing, and analyzing data on the effectiveness of forested wetland regeneration. In addition this study was intended to provide a general idea of whether there appears to be a problem with forested wetland regeneration. This pilot study was not designed to provide statistically significant results that prove or disprove a hypothesis. Rather, it was intended to provide a basis for WETSAG members to establish sound scientific methodology for future evaluations of forested wetland regeneration.

A total of 25 sites were visited. However, only 15 sites contained forested wetland that had been harvested. The data collected from these 15 sites indicate that all but one site is meeting the State Board Manual acceptable stocking level for conifers greater than 4.5 feet in height. The data collected from this pilot study suggest that regeneration of seedlings and saplings is occurring on forested wetlands.

Identifying forested wetlands that have been harvested was extremely difficult. National wetland inventory (NWI) coverage for forested wetlands was both inaccurate and incomplete. Relying on landowner recollections of wetland areas was also somewhat unreliable. The investigators found no solution to the problem of finding suitable forested wetlands for the study.

Methods were developed to collect and summarize data in order to evaluate the effectiveness of regeneration on forested wetlands that have been harvested. However, an efficient and non-biased method for sampling forested wetland sites was not achieved.

Session 2

Abstracts

The Fish Habitat Model: Predicting the Upper Limits of Fish Habitat in Eastern and Western Washington

Contacts: Steve Duke, Weyerhaeuser
Bob Conrad, NWIFC
Martin Liermann, NOAA
Eddie Cupp, Terrapin Environmental

Models that predict the upper limits of fish distribution can be useful tools in the water typing process. Models have now been developed for western and eastern Washington. This talk will summarize and compare the results of the eastern and western models. It will also present some results from the Pilot Validation Study, which was carried out using the western model.

Water Typing Model Field Performance Assessment

Contact: Eddie Cupp, Terrapin Environmental

The Instream Scientific Advisory Group requested development of a study plan to provide an unbiased characterization of model performance across State and private forest lands in western Washington. The study plan includes the sampling design, field methods, data compilation/processing, and data analysis and interpretation procedures. Standard protocols for verifying the upstream distribution of fish in the field (end of fish points, EOFP), measuring stream morphology and habitat characteristics, locating model predicted EOFPs on the ground, and mapping field verified EOFP are included in this plan to ensure consistent data collection techniques. Prior to final acceptance of the Study Plan, the ISAG requested the study protocol be tested as part of a pilot study. The field model performance assessment was conducted on 369 predicted end of fish points (EOFPs) within 15 randomly selected basins. Mean net and absolute prediction error distances were for defined channels was estimated as to -185 $\pm$ 129 feet and 287 $\pm$ 94, respectively. The model correctly classified fish absence or presence in over 90% of the DEM-portrayed stream network. Seventy five percent of the predicted EOFPs associated with defined channels were correct (zero error). Approximately 92% the of total error distance was associated with the 41 terminal EOFP predictions. Six terminal predictions situated upstream of steep channel features that were readily apparent on the DEM generated channel profiles accounted for 46% of the total error measured. The pilot study demonstrated the practicality of the study plan protocol. Sample size requirements for achieving a range of precision in estimating mean prediction error were investigated with the pilot results.

Type 5 Experimental Buffer Study: Stream Temperature and LWD components

Contacts: W. Ehinger and J. Janisch, Washington Department of Ecology

The Type 5 Experimental Buffer Study, conducted in cooperation with Washington DNR and the US Forest Service, was designed to compare the effects of three different riparian buffer configurations on riparian vegetation, biota, and stream temperature. The study treatments include: 1) an unharvested reference; 2) 50' buffer along entire Type 5 stream; 3) a variable-width buffer; and 4) no buffer. Study streams are distributed across eight stands in Capital Forest and the Willapa Hills and application of harvest treatments to all streams is expected to be complete by summer 2005. To date, one to two years of pre-harvest data have thus been collected at all sites and will be followed by at least two years of post-harvest data collection. The Department of Ecology has focused on collecting stream temperature and air temperature data at multiple locations within each stream, as well as evaluating inchannel LWD loads. Additional data, such as inchannel hemispherical riparian canopy photos and surface flow surface surveys have also been collected to aid interpretation of temperature data.

Type N Buffer Characteristics, Integrity and Function Study- Abstract

Contact: Dave Schuett-Hames

The Type N Buffer Characteristics, Integrity and Function study is a CMER effectiveness monitoring project administered by the riparian scientific advisory group (RSAG). The purpose is to evaluate the effectiveness of FFR riparian prescriptions for perennial non-fish bearing (Type Np) streams in an operational forest practices setting. Performance will be evaluated by examining tree mortality, stand development, shade, large woody debris (LWD) recruitment, and soil and stream-bank disturbance. The study is designed to document post-harvest conditions at sites where the prescriptions have been applied (treatment sites), to document the magnitude and duration of change at treatment sites in comparison with untreated control sites, and to evaluate the influence of site co-variates on the monitoring metrics.

Phase I (feasibility testing) is underway. A random sample of 15 forest practice applications (FPAs) from the west side of the state were selected from the DNR Forest Practice Application Review System database and paired with untreated control sites. The characteristics of the treatment sites varied greatly due to the complexity and flexibility built into the procedures used to determine the buffer requirements under the west side Type Np riparian prescriptions. Seven sites had 50 ft no-cut buffers for their entire length, five sites had both a clearcut and a buffer patch, two sites had both a perennial initiation point (PIP) buffer and a clearcut patch, and one site had a PIP buffer, a clearcut and a buffer patch.

Several data collection methodologies were used and evaluated. A network of sampling stations was established at systematic intervals along the stream channel to collect canopy closure data (including both densiometer measurements and hemispherical canopy photography) as well as data on the percentage of channel covered by live plants and debris. A survey of the entire equipment limitation zone (a 30 ft wide band on both sides of the stream) was done to document soil and stream bank disturbance attributable to timber harvest activity. Two rectangular plots were established in each patch. These plots were 60 ft in length along the stream and extended out 50 ft from the bankfull channel in both directions. Measurements were taken on all standing trees and snags, including diameter, species, and condition and a stem map of tree locations was created. Data were also collected on fallen trees, including fall aspect, diameter, distance from stream and recruitment to the bankfull channel. Saplings and understory vegetation were documented using circular plots arrayed along a transect perpendicular to the stream. A limited amount of information was collected from within the bankfull channel adjacent to the plot, including data on the frequency and characteristics of LWD and channel steps. Finally, low altitude stereo photographs at a scale of 1:2000 were collected over the entire site. Images were scanned and interpreted in a digital stereo application that allowed data to be extracted and stored in GIS files. Data were collected on all live trees (including species, height and crown area) and fallen trees (fall azimuth, diameter, length and length intersecting the bankfull channel) and a map showing the locations of these features was produced. Several physical site measurements were collected, including stream and hill-slope gradient, valley width and stream aspect.

The next step is to report to CMER on the results of Phase I sampling. Recommendations will be developed concerning the feasibility of the sampling design including random sampling of FPAs and the feasibility of finding suitable control sites in an operational setting. The various data collection methods will also be evaluated.

Pre-Hardwood Conversion Harvest Vegetation Characteristics on Westside Type F Streams

Contact: Steve McConnell, RSAG, NWIFC

Red alder stands currently comprised of red alder and other hardwoods are often found on sites once dominated by conifers. Conifers provide larger, longer lasting wood and more shade to streams than do red alder trees. Converting stands back to conifer therefore may benefit fish habitat. The potential for long-term gain in LWD and shade must be balanced against possible short-term effects to streams that could result from, for example, increased stream temperature or sediment input. In this project, case study analyses are done for nine stands on which operational scale hardwood conversion treatment is implemented. Timber harvest will occur no closer than 25' from streams and extend further where unstable slopes or wet soils are encountered and all conifer trees in the core and inner zones will be left. Landowners will regenerate sites to conifers using their choice of planting stock, planting methodology, shrub control, protection against animals and other options that could influence planting success. The study design and pre-treatment stand conditions are presented and attributes to be collected for economic analysis are described.

Pre -Hardwood Conversion Harvest Stream Temperature and Shade Characteristics on Westside Type F Streams

Contact: Mark Hunter

Abstract: In the summer of 2003 and 2004, pre-harvest water temperature and hemispherical canopy images were collected from 9 hardwood conversion treatment sites. Sites reflect a variety of channel widths, flows, gradients and substrates. Both summer seasons were dry, however, significant summer storms occurred in late August 2004. Permanent markers were placed at transects located 25 m apart. Hourly water temperature data was collected from the thalweg at 75 m intervals (every third transect) using submersible temperature dataloggers. In addition, water temperature and air temperature were collected from an upstream control transect, and water temperature was collected from up to 4 downstream control transects. A total of 160 temperature stations were established. Digital hemispherical images were taken at every transect. Examples of pre-treatment temperature data from an alluvial site and bedrock-dominated site are provided for contrast. Harvest was completed at one site in August 2004, and the remaining sites are scheduled for harvest in 2005.

Session 3

Abstracts

Forest Practices Applications Analyses: Current and Possible Future Stand Characteristics

Contact: Steve McConnell, RSAG, NWIFC

Using forest practices applications (FPAs) from 2000 and 2001, the expected stand basal area at age 140 for each of three possible "Forest and Fish" prescriptions for the core and inner zones of riparian areas were analyzed using the DFC Model. The outcome of either doing no timber harvest, thinning from below in the inner zone leaving a minimum of 57 trees per acre, or cutting trees closest to the stream leaving a minimum 80' no-cut are along small (<10' wide) streams or a 100' no-cut area along large (>10' wide) streams all resulted in stand basal area at age 140 that was not materially different from measured basal area in the recently completed RSAG CMER DFC study. The limiting constraint to timber harvest in riparian areas is only infrequently the basal area targets specified in rules; more often it is the other constraints of the minimum leave tree requirements and floor width for the thin-from-below and leave-trees-closest-to-the-water prescriptions, respectively. These results are currently being validated with more recent FPAs and comparison against other growth and yield models.

Roads Program Overview

Contacts: Curt Veldhuisen, Bob Palmquist, Mary Raines, Jeffrey Clark and Drew Coe

The Roads sub-group of UPSAG manages science and monitoring of forest roads related to the Forest and Fish rules. This presentation provides a brief overview of the accomplishments of the roads program and the direction for the next few years. The roads program utilizes three investigative approaches: literature reviews, effectiveness monitoring and performance target validation. A literature review on the effects of forest roads on hydrologic processes was completed in 2004 and no other literature review is planned. Monitoring the effectiveness of road improvements is a dominant thrust of the roads program. Two field-based effectiveness monitoring studies are projected—one for site-scale and the other small-watershed-scale effects. Both projects involve state-wide sampling. The watershed-scale project will evaluate mitigation efforts toward surface erosion and hydrologic connectivity and is expected to begin later in 2005. The sub-group is presently scoping a site-scale project which would evaluate the effectiveness of individual road treatments. The roads group hopes to determine whether existing performance targets for roads can help achieve desired improvements in fish habitat and water quality in collaboration with the Intensively Monitored Watersheds program.

The Hydrologic Effects of Roads at Varying Spatial and Temporal Scales: A Review of Published Literature as of April 2004

Contact: Drew Coe

Examining the state-of-art-knowledge on road hydrology is a fundamental step in addressing the adequacy of FFR functional objectives for managing the hydrologic effects of roads. At the site scale, roads alter hillslope runoff processes through the generation of Horton overland flow (HOF) and the interception of subsurface stormflow (ISSF). ISSF is the dominant form of road runoff, comprising approximately 90% of the total road runoff for studies in the Pacific Northwest. Road runoff is delivered to the channel network at stream crossings and through road-induced gullies and landslides. Road runoff converts relatively slow hillslope flow to rapid surface flow, thereby augmenting peak runoff at road segments that are connected to the channel network. Despite speculations to the contrary, most paired watershed studies have found little or no evidence of peak flow increases due to roads at the small watershed scale (i.e., 60-800 acres). No evidence of road-induced peak flow increases were found at the large watershed scale (5-230 mi^2). Modeling studies have shown that roads can increase the mean annual peak flow by approximately 11-12% per 2% of watershed area disturbed by roads. Field practitioners can reduce the hydrologic impacts of roads by recognizing areas that are more susceptible to ISSF, and adjusting road design accordingly.

Road Sub-Basin Scale Effectiveness Monitoring Design – Abstract

Contacts: Mary Raines, Robert Conrad, Robert Palmquist, Drew Coe, Jeffrey Clark, Curt Veldhuisen

UPSAG developed a state-wide program for evaluating the effectiveness of FFR road rules at the sub-basin scale. This project is designed to determine the degree to which: 1) road attributes or conditions that affect water and sediment production and delivery are improving over time, and 2) FFR sub-basin performance targets for surface erosion and connectivity to streams are being achieved. To accomplish this, the status and trend in characteristics of the forest road prism among a statewide sample of roads will be measured or observed and reported. Fifty randomly selected 6 mi^2 samples will be selected from statewide forest lands under FFR rules, independent of ownership. Monitoring events will occur at five year intervals and extend through at least 2016, the year by which new road maintenance and abandonment rules are required to be fully implemented. WARSEM, a revised version of Washington's watershed analysis surface erosion model, was chosen as the data collection platform because it: 1) accounts for road attributes affecting surface erosion, 2) allows data from the road site or segment level to be scaled up to a meaningful resource level, and 3) calculates an estimated sediment volume index for comparing observed road conditions to established performance targets. The project is expected to begin late in 2005.

Unstable Slopes Program Overview

Contact: Julie Dieu, Rayonier

Mass wasting "Rule Tool" projects, as well as effectiveness and intensive monitoring projects in the CMER Work Plan are developed and managed through UPSAG. Most of our efforts have been focused on the "Rule Tool" projects because the Unstable Landform Identification Program is key to the FFR unstable slopes rule strategy – to identify unstable slopes and then either avoid them or conduct a risk evaluation through the SEPA process.

UPSAG has completed two "Rule Tool" projects. The development of a Shallow Rapid Landslide Screen for GIS was accomplished during and just after the FFR Negotiations, and has now been finalized through SRC Review and CMER approval. This screen exists for all of Western Washington and can be accessed at www.dnr.wa.gov/forestpractices/data, under the tab marked "Slope Stability". It is being used by stakeholders during the planning, development and review of FPA's.

The second completed project is the refinement of an evapo-transpiration model to assess the vulnerability of glacial deep-seated landslides to timber harvest. Model results suggest that evapo-transpiration plays an important role in the total water budget, and that this may play a more or less critical role in the stability of deep-seated landslides depending on the permeability of the glacial materials. However, these results need field validation.

UPSAG has two active "Rule Tool" projects. The Regional Unstable Landform Identification Project (RLIP) has been conducted as a stakeholder process in all the DNR regions, and its results are nearly finalized. It identifies unstable landforms that are specific to an area or a geologic unit that do not meet the statewide landform definitions. The Landslide Hazard Zonation Project is nearing the end of its first biennium. Its products include two GIS layers, a landslide inventory and potentially unstable landforms with hazard assignment, and reports that describe local processes and triggers for individual watershed administrative units. The compiled data can be accessed at www.dnr.wa.gov/forestpractices/data, under the taps marked "Landslides" for the Landslide Inventory and "Hazard Zones" for the areas of landslide hazard. The individual assessments can also be accessed online at www.dnr.wa.gov/forestpractices/lhzproject.

Currently, UPSAG is scoping three effectiveness monitoring projects simultaneously. These are: 1) Accuracy/Consistency in the Identification of Unstable Slopes; 2) Landscape-Scale Effectiveness Monitoring; and 3) Prescription-Scale Effectiveness Monitoring. Landscape-Scale Effectiveness Monitoring is the highest ranking unstable slope project on the CMER Work Plan, but UPSAG has chosen to do the initial scoping of all three projects to identify whether there is a cost-savings in doing two or all three of these together.

Results from the 1st Biennium of Data Collection: Landslide Hazard Zonation Project, Washington State

Contact: Laura Vaugeois, DNR

The authors of the Forests & Fish Report identified a need to identify and map the unstable slopes of the state. The Landslide Hazard Zonation (LHZ) Project was developed by UPSAG to address that need. The goal of this project is to eliminate the error of omission during the forest practices permitting process by identifying, describing, and mapping unstable landforms. The overall objectives of the LHZ Project are to create an integrated screening tool that:

1. Exists within and is utilized from GIS;
2. Utilizes existing data effectively;
3. Validates hazard assessment of potentially unstable landforms by applying a consistent assessment methodology to priority forested watersheds in the state; and,
4. Is useful to and accessible by all stakeholder groups.

During a series of CMER discussions, this project was identified as a "rule-tool" development project because it uses a standardized, professionally accepted method and techniques and is not a research project. However, oversight has been assigned to a Technical Advisory Group within CMER.

As a precursor to this project, all available digital landslide inventories and mass wasting map units were collected and compiled into two GIS databases. These compiled datasets are available for free download at dnr.wa.gov/forestpractices/data, under the tabs marked "Landslides" and "Landslide Hazard Zones". These hazard zones include information from watershed analyses, from this project, and from other projects. As the LHZ team creates more data, these are added to these two datasets and the website is updated semi-quarterly.

Two other websites were created to facilitate public involvement and access to the products as they are being created (dnr.wa.gov/forestpractices/lhzproject). One page is for public comment on draft assessment products. Another is for public access to the final products. Products from this project include two maps (at 1:24:000 or better): landslides and hazard zones; and a document that describes the units and triggering mechanisms.

Implementation guidelines for the use of these products have been developed and presentations have been delivered at the regional TFW cooperators, Forest Practices coordinators, WFPA, and professional meetings. The implementation guidelines are posted on the 'final products' webpage to provide a clear, consistent intent of the purpose and the use of these products.

The technical advisory group revised the mass wasting module of watershed analysis to improve inter-analyst consistency and to derive consistent hazard calls. The LHZ team completed a test of the protocol in February of 2005. The protocol is also posted on the 'final products' webpage, to provide a transparent mechanism for the public to understand how the products were created.

During the first year, 41 of the original 44 Priority 1 and 2 watersheds have been completed. During the second year of the project, to date, one Priority 3 watershed is completed, two are in review and eight watersheds are in process. Over 1 million acres were reviewed and mapped during this biennium and 2177 new slides were mapped. Overall, approximately 30,000 landslides have been compiled as have more than 26,000 mass wasting map units.

Regional (Unstable) Landform Identification Project (RLIP)

Contact: Venice Goetz

The RLIP was an FFR-identified project that allowed us to:

- identify unstable landforms that are
- *region-specific* and that are
- not already described in the Forest Practices Unstable Slopes Rules.

The goal of the RLIP was for the identified landforms to eventually become part of the Unstable Slopes Rules. Toward this end, we have generated a statewide GIS data layer of regionally unique unstable landforms that were identified through the RLIP process. Regional maps have been produced from this layer and are accompanied by documents with corresponding descriptions of the landforms and the situations that exacerbate instability (triggering mechanisms). The maps and accompanying documents have been reviewed by the regional working groups of qualified experts and by UPSAG and are presently available to the Landslide Hazard Zonation (LHZ) mapping team.

The project has resulted in 4 mapped and validated landforms:

- 2 in Pacific Cascade Region
  - knife-edged ridges in Lower North WAU
  - 70-80% headwalls in Palix WAU
- 1 in Olympic Region
  - 70-80% headwalls in E/W Humptulips, Wishkah Headwaters WAUs
- 1 in NW Region
  - continental glacial terrace edges in Stillaguamish WAU

Continental and alpine glacial terrace edges were recognized in 5 of DNR's 6 regions and have the potential to become statewide landforms. UPSAG has proposed that the LHZ mapping team focus effort on these and 5 other proposed landforms that were not studied.

Another result of the project is a list of geologic units that tend to produce deep-seated landslide movement. This information is for the guidance of the LHZ team only and these data will not be published independently of the LHZ project.

Session 4

Abstracts

Overview of Eastern Washington riparian assessment program

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Forested environments in eastern Washington are very divers with little information available specific to lands governed by FFR rules. The Scientific Advisory Group – Eastside was established to inform the uncertainties of the science underlining these rules and to help determine the Desired Future Conditions and wood loading targets. This overview will outline where the uncertainties are and what steps are being taken to fill in the gaps.

Review of the Available Literature Related to Wood Loading Dynamics in and around Streams in Eastern Washington Forests

Contact: Lynda Hofmann, SAGE Co-chair, WDFW, Twisp, WA, E-mail:hofmalah@dfw.wa.gov

The CMER-SAGE literature review project entitled *Review of the Available Literature Related to Wood Loading Dynamics in and around Streams in Eastern Washington Forests* was completed for the Sate of Washington Department of Natural Resources in October 2004, by Herrera Environmental Consultants Seattle Washington.

The literature review is a synthesis of the available literature on Eastern Washington Wood Loading focusing heavily on providing quantitative information. The objective of the literature review was to provide SAGE with the background information necessary to develop a scientific research approach to begin validating, or developing the following LWD issues as required under the Forest and Fish agreement:

- **LWD 1:** Validate assumptions; models, and data used to develop eastside stand conditions.
- **LWD 10**: Develop Performance Targets for in stream LWD amounts for all stream types.
- **LWD 11**: Investigate the delivery of LWD from off-site, upstream locations, and test the cumulative effectiveness of the riparian and mass wasting prescriptions in contributing LWD to down-stream channels.
- **LWD 16:** Validate the assumptions underlying in-stream LWD targets by determining the effectiveness of different LWD sizes in habitat formation and the probability of recruitment and long-term stability.
- **LWD 17:** Develop (priority) and validate indexes of LWD recruitment in relation to eastside disturbance regimes.
- **LWD 19:** Determine basin-wide targets for LWD loading, and test the cumulative effectiveness of the prescriptions in meeting them. Validate models to predict regional LWD recruitment.

In order to focus the synthesis, the contractors were asked to provide literature as it related to 41 questions that were grouped into nine categories. Those categories were:

1. Wood Loading
2. Wood Distribution
3. In stream Manipulation
4. Decay Rates
5. Wood Transport
6. Pool Formation
7. Bed load Transport and Sediment
8. Riparian Channel and Condition
9. Wood Recruitment and Mortality

SAGE is currently working on a scoping document entitled *Eastside Instream Wood Characterization Project* as part of our Type F Program. This field project will rely heavily on the conclusions provided in the literature synthesis.

A Review and Synthesis of Available Information on Riparian Disturbance Regimes In Eastern Washington

Contact: Lynda A. Hofmann, WDFW Forest and Fish Biologist, Twisp, WA, E-mail: hofmalah@dfw.wa.gov

In 2002, the Science Advisory Group Eastside (SAGE) contracted with Concurrent Technologies Corporation (CTC) to write a Review and Synthesis of Available Information on Riparian Disturbance Regimes in Eastern Washington. A total of 17 questions were posed to the authors on the ecology and management of riparian forests. The questions were a subset of the CMER L-1 list of questions contained in the Forest and Fish Report. The objective of the synthesis was to evaluate the scientific merits of the existing Forest and Fish regulations for Eastern Washington. Two major themes were addressed in the questions:

1. Validation of the use of elevation bands as a surrogate for forest habitat types.
2. Validation of the use of inherent disturbance regimes as an appropriate reference for managing riparian forests east of the Cascade crest.

Workplan for the Eastside Type F Riparian Assessment
Project: Current Conditions of Riparian Stands in Eastern Washington

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The Scientific Advisory Group for the Eastside (SAGE) is currently developing a workplan that will implement Phase 1 of the Eastside Type F Riparian Assessment Project. As outlined in SAGE's June 2004 Scoping Document, five key objectives frame the work to be conducted during this project:

1. Determine range and distribution of current riparian stand conditions.
2. Determine the relationship between site characteristics and riparian stand attributions.
3. Determine the effect of proximity to the stream on the characteristics of eastside stands.
4. Determine the frequency and distribution of mortality and insect and disease effects in eastern Washington riparian stands.
5. Document management practices and other disturbance factors that affect eastern Washington riparian stands.

The Workplan will frame these objectives, identify related questions and data sources, recommend statistical approaches for site selection and analysis, and present schedules for fieldwork and reporting. Phase 1 will refine field methods and lead to a broader, more comprehensive assessment of current stand conditions in Phase 2.

This study will take place on forested lands in eastern Washington subject to Forest and Fish Rules (FFR Lands). To ensure representativeness of the data across the varied stand conditions within FFR Lands, SAGE will stratify sample site selection using vegetation zones developed by Henderson et al. (1992). Henderson's vegetation zones are based on predicted precipitation, elevation, temperature, soil moisture, aspect and other climatic drivers (Henderson, unpublished) that collectively determine stand characteristics. Henderson zones will be the principal *a priori* means of stratifying riparian stand data. Analysis of field-based variables will allow rigorous analysis of current stand conditions, as well as departure from model-based zones as a result of existing disturbance regimes.

Eastside Riparian Shade and Temperature Effectiveness Study

Contact: Eddie Cupp, Terrapin Environmental

This study addresses the effectiveness of Eastside Forests and Fish riparian rules in protecting and maintaining shade and cool stream temperatures. The study is a before/after, control/impact experimental design to determine whether the riparian prescriptions are effective for the bull trout habitat overlay and the standard Forests and Fish prescriptions (i.e. treatments) and whether they provide similar protection for stream temperatures. Each site consists of a 300 m no harvest reference reach upstream of a 300 m treatment reach where one of the two prescriptions is applied. Continuous temperature recorders are installed in the stream at 150-m intervals between the upper boundary of the reference reach and the lower boundary of the treatment reach. Canopy cover and stream temperatures will be measured for at least two summers before and two summers after streamside harvesting. One study metric will be the difference between the upstream and downstream thermographs in the reach within a stream. If the treatment has no effect on stream temperature then we would expect the sample site difference in the change in temperature (Δ_T) between reaches pre-harvest would be the same as the difference post-harvest. The study is in its third field season and all data collected thus far has been on pre-treatment conditions. A total of 48 candidate sites have been identified and temperature dataloggers have been established in 41 sites. Under pre-treatment conditions, the study sites are all well shaded (mean canopy closure is 92%) with relatively cool stream temperatures. Single-day maximum water temperatures exceeded 16°C at only three sites and none exceeded 18°C. The treatment reaches have been prepared for harvest on a total of 21 sites. Eight sites are expected to be treated (harvested) prior to the beginning of the 2005 temperature recording season.

Effectiveness of the Current TFW Shade Methodology for Measuring Attenuation of Solar Radiation to the Stream – Pre-Harvest Field Summary

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In 2003, CMER implemented two connected studies designed to determine the effectiveness of the eastern Washington riparian shade prescriptions. This presentation summarizes the methodology and the first two field seasons of the "solar radiation" study. The primary working hypothesis for this study is that there is no significant difference in solar energy reaching the stream pre- and post-harvest when the "all available shade" rule is applied. Seventeen stream sites (nine in 2003, eight in 2004) have now been surveyed prior to harvest. Adjoining reference and treatment reaches (300 meters each) were established on each stream, and solar radiation data were collected at 50 meter intervals by a 2-man crew working simultaneously within each reach. To ensure symmetry around solar noon, the timing of data collection was pre-programmed based on known solar elevations at a particular site. Solar radiation data were also collected at a nearby, unobstructed hilltop site. Average ratios of percent available radiation (PAR) for these 17 sites ranged from 3 to 18 percent. Paired t-tests with simulated post-harvest data indicate increases in post-treatment radiation of approximately 10% will be detectable. Hilltop and stream instrument data at Cole Creek were collected during the same week on a nearly cloudless day, and again on a day with sustained broken clouds. These data suggest that attenuation of solar energy is high and relatively constant, regardless of cloud conditions. Data collected to date suggest that the best test for treatment effects will be a straightforward pair-wise comparison of control reach versus treatment reach radiation. Hilltop data will continue to be used to assess attenuation and for assuring that project QA/QC goals of 75 percent full sun are achieved.